

REMARKS

This communication responds to the Office Action mailed on January 23, 2008. Claims 1, 7, 24, 29 and 39 are amended, no claims are canceled, and no claims are added. As a result, claims 1-11, 24-34 and 39-42 are now pending in this Application. The Office is respectfully requested to enter all amendments for purposes of appeal.

Double Patenting Rejection

Claims 1-11, 24-34, and 39-42 were provisionally rejected under the nonstatutory obviousness-type double patenting over claims 13-15, 19, and 23-24 of co-pending Application No. 11/494,056.

Applicant does not admit that the claims are obvious in view of co-pending Application No. 11/494,056. However, a Terminal Disclaimer in compliance with 37 C.F.R. 1.321(b)(iv) will be considered upon indication of allowance of the claims.

§103 Rejection of the Claims

Claims 1-4, 7-11, 24-34, and 39-41 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu ('078) in view of Szejewski ('499). Applicant respectfully traverses this rejection, because the Office has not properly established a *prima facie* case of obviousness.

Liu discloses a first photoresist mask 106 to etch a first pattern 108 and then a second photoresist mask 110 to etch a second pattern 112 in an amorphous carbon hard mask 104 and individually removing the photoresist masks 106 and 110 by a plasma process (see figures 2C and 2E). Liu does not contain any suggestion or discussion of residual photo resist problems as admitted by the Examiner in the second paragraph on page 9 of the outstanding Office Action. The combination pattern in the hard mask 104 of the first and the second masks is used to etch a final pattern 116 into the substrate 102.

Applicant respectfully submits that Liu does not suggest a problem with residual photoresist, and thus does not suggest treating the surface of the substrate to remove the non-

existent residual resist under conditions that are selective to the hard mask and to the substrate. Liu does not provide any possible reason for one of ordinary skill in the art to make the proposed combination of references, since there is no recognition of such an issue existing in Liu. The Examiner admits this deficiency in Liu at least in the Office Action dated May 2, 2007 on page 5, second paragraph, and in the present outstanding Office Action on page 9, second paragraph. Applicant respectfully submits that Liu teaches a master mask process, and can not properly provide motivation to make the proposed combination of references to obtain a residual resist removal method.

Szwejkowski discloses removing a silicon and oxide containing sidewall material 26 formed on the sides of photoresist 32 and polysilicon line 28 during an etch of the polysilicon layer 20 (col. 1, lines 32-42, and col. 2, lines 4-11). The sidewall material 26 is not a residual portion of the photoresist 32, which is still shown in figure 2 and has clearly not been removed. The sidewall material is stated to not be an organic polymer material at least at column 3, lines 7-11, where it states that these “sidewall portions 28 are not purely polysilicon”.

In view of the above discussion, Applicant respectfully disagrees with the Examiner’s statement on page 9, second paragraph of the outstanding Office Action that “Szejewski (‘499) does not explicitly state that polymeric silicon oxide-containing residue on the polysilicon layer is resist, it is inherent the residue includes resist material, which remains for the process where the resist layer is used as an etch mask for the underlying polysilicon layer”, and notes the reference refers to sidewall 26 as being “not purely polysilicon” (see col. 3, line 8) and clearly not a photo resist residue. Applicant submits that one of ordinary skill in the art would never attempt to remove sidewall material 26 using HF if it was an organic material such as a resist. The reference clearly teaches that the film 26 is formed of silicon and oxides (see at least col. 2, lines 29-38; col. 3, lines 5-11) and exists while the photoresist 32 is still on the substrate.

Applicant respectfully submits that the suggested combination of references fails to describe or suggest at least the claimed features of “...surface treating the substrate after removing the patterned resist to remove residual resist disposed in contact with at least one of the top surface of the hard mask and the substrate under conditions that are selective to the hard mask and to the substrate...”, as recited in independent claim 1, as amended herein, from which

claims 2-6 depend. Neither reference suggests an organic photoresist residue, nor a residue on the hard mask, nor a residue in contact with the substrate. Certainly neither reference suggests removing any residue after the resist is removed, since the Examiner has admitted that Liu does not contain any teaching on removing residues, and Szejewski removes what the Examiner incorrectly refers to a residual resist 26 before removing the resist 32. The other independent claims contain similar language and are thus also held to be in patentable condition over the proposed combination of references.

The dependent claims are believed to be patentable at least as depending from patentable base claims as shown above, since any claim depending from a nonobvious independent claim is also nonobvious. See M.P.E.P. § 2143.03. In view of the above noted claim amendments, and discussion of the failure of the references to describe or suggest at least removing residual photoresist in contact with the substrate as opposed to in contact with the resist pattern, Applicant requests that this rejection under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Claims 5-6, 11, 25-29, and 31-34 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu ('078) in view of Szejewski ('499) as applied to claims 1-4, 7-11, 24-34, and 39-41 in paragraph 9 above, and further in view of Chen ('435). Applicant respectfully traverses this rejection.

Liu suggests two different photoresist masks 106 and 110 to etch a first pattern 108 and a second pattern 112 in an amorphous carbon hard mask 104. The photoresist layers are each removed after each etch by a plasma process, and the Examiner admits there is no suggestion of residual photo resist problems.

Szejewski suggests removing a silicon and oxide containing sidewall material 26, which is on a side portion of the photoresist 32, and is clearly not a residue or an organic polymer material. The sidewall 26 is not a photoresist residue since it is removed by HF and is clearly formed of silicon and oxides (col. 2, lines 29-38; col. 3, lines 5-11). Applicant respectfully submits that the cited reference does not teach or suggest removal of an organic photo resist residue after removal of the photoresist as recited in the present claims.

Chen is used in the outstanding Office Action to show that solutions of ammonium hydroxide and peroxide are known in the art. Applicant respectfully submits that the addition of Chen does nothing to cure the above noted failure of the other references to teach or suggest a surface treatment to remove residual photo resist material.

Applicant respectfully submits that the suggested combination of references fails to describe or suggest at least the claimed features of “...*surface treating the substrate after removing the patterned resist to remove residual resist disposed in contact with at least one of the top surface of the hard mask and the substrate ...*”, as recited in independent claim 1, as amended herein, from which claims 5-6 depend. Neither reference suggests a photoresist residue, nor a photoresist residue in contact with the substrate.

Applicant respectfully submits that the remaining independent claims are also patentable over the suggested combination of references for similar reasons. The dependent claims are believed to be patentable at least as depending from patentable base claims as shown above, since any claim depending from a nonobvious independent claim is also nonobvious. See M.P.E.P. § 2143.03. In view of the above noted claim amendments, and discussion of the failure of the references to describe or suggest at least removing residual photoresist, Applicant requests that this rejection under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Claim 42 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu ('078) in view of Szejewski ('499) as applied to claims 1-4, 7-11, 24-34, and 39-41 in paragraph 9 above and further in view of Fang ('338). Applicant respectfully traverses this rejection.

Liu and Szejewski have the features discussed above. Fang is used in the outstanding Office Action to show that it is known to use solutions including sulfuric acid and citric acid. Applicant respectfully submits that the addition of Fang does nothing to cure the above noted failure to suggest a surface treatment to remove residual photo resist material.

Applicant respectfully submits that the proposed combination of references fails to describe or suggest at least the claimed features of “...*surface treating the substrate after removing the patterned photoresist to remove residual photoresist in contact with the substrate ...*”, as recited in independent claim 39, as amended herein, from which claim 42 depends. The

Serial Number: 10/788,889

Filing Date: February 27, 2004

Title: SURFACE TREATMENT OF A DRY-DEVELOPED HARD MASK AND SURFACE TREATMENT COMPOSITIONS USED THEREFOR

cited references do not suggest either removing residues after removal of the photoresist, or a surface treatment to remove residual photoresist or photoresist in contact with the substrate. Thus, the combination of references, even if there were proper motivation shown to make the combination, does not suggest all the recited claim features.

Dependent claim 42 is believed to be patentable at least as depending from a patentable base claim, since any claim depending from a nonobvious independent claim is also nonobvious. See M.P.E.P. § 2143.03. In view of the above noted claim amendments, and discussion of the failure of the references to describe or suggest at least removing residual photoresist, Applicant requests that this rejection under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Reservation of Rights

In the interest of clarity and brevity, Applicant may not have equally addressed every assertion made in the Office Action, however, this does not constitute any admission or acquiescence. Applicant reserves all rights not exercised in connection with this response, such as the right to challenge or rebut any tacit or explicit characterization of any reference or of any of the present claims, the right to challenge or rebut any asserted factual or legal basis of any of the rejections, the right to swear behind any cited reference such as provided under 37 C.F.R. § 1.131 or otherwise, or the right to assert co-ownership of any cited reference. Applicant does not admit that any of the cited references or any other references of record are relevant to the present claims, or that they constitute prior art. To the extent that any rejection or assertion is based upon the Examiner's personal knowledge, rather than any objective evidence of record as manifested by a cited prior art reference, Applicant timely objects to such reliance on Official Notice, and reserves all rights to request that the Examiner provide a reference or affidavit in support of such assertion, as required by MPEP § 2144.03. Applicant reserves all rights to pursue any cancelled claims in a subsequent patent application claiming the benefit of priority of the present patent application, and to request rejoinder of any withdrawn claim, as required by MPEP § 821.04.

AMENDMENT AND RESPONSE UNDER 37 CFR § 1.116 – EXPEDITED PROCEDURE

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CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone the Applicant's attorney at (210) 308-5677 to facilitate prosecution of this Application. If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

SCHWEGMAN, LUNDBERG & WOESSNER, P.A.
P.O. Box 2938
Minneapolis, MN 55402
(210) 308-5677

Date March 24, 2008

By Mark V. Muller
Mark V. Muller
Reg. No. 37,509

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being filed using the USPTO's electronic filing system EFS-Web, and is addressed to: MS AF, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 24th day of March 2008.

Amy Moriarty
Name

[Signature]
Signature